C2M2L-1 BAA 11-47
Questions and Answers
July 8, 2011

Note: Questions 1 to 22 were posed to the DARPA Program Manager during the C2M2L-1 Proposer's Day IRC chat session held on June 23, 2011. Slight modifications have been made to the chat session log to improve readability. All successive questions were submitted to DARPA via email.

Question 1:
Relative to the maturity of concepts that are acceptable to TA5, do you see agent-based computer economic models being a viable option as a way to explore the space of economic policy options for support of C2M2L-1 models? Or is TA-5 more narrowly focused around research of existing support models/ideas?
Answer 1:
The criterion would be that it has to be able to be developed to a point where it is usable/deployable at scale for AVM in the course of the C2M2L-1 period of performance, i.e., 12 months. It is up to the proposer to decide on the specific topic of agent-based modeling. It cannot be too blue sky/fundamental research; it needs to be deployed for AVM use, but we are also not looking for COTS solutions that we can just buy off the shelf.

Question 2:
On page 4 in the bulleted list, item 2--observable measures of complexity is a hard one. In the performance period it may not be very practical to come up with real, robust measures, any comments?
Answer 2:
The list you are referring to is being developed under the META program, and while it is hard, we are making progress.

Question 3:
Can you give us your thinking on the desirable scale of projects? Large teams can assure coordinated coverage across the full range of needed models or technical needs, but multiple smaller proposals perhaps give you more ability to pick and choose. Which approach will fit the programs goals better?
Answer 3:
Both are acceptable though you are right that multiple smaller efforts, focusing on core strengths, make it easier for DARPA to ensure that we have coverage and a diversity of approaches, while fitting within budget constraints. Also the BAA is silent, but does not preclude you from proposing options in a single proposal (though the proposal page count limit is still firm in that case).

Question 4:

The discussion of manufacturing models in TA 3 includes both component assembly and manufacturing steps that involve shaping or other forming operations. Could you comment on the extent to which C2M2L-1 (and especially FANG) are focused on assembly of library components vs. on-site manufacture using legacy tools/processes?

Answer 4:

First, with regards to assembly of existing (COTS/GOTS) components vs. making new ones, we are interested in both, as both will inevitably be part of a new vehicle design. Second, about on-site manufacturing--it does not have to be on-site. iFAB can be a distributed manufacturing capability, and so the C2M2L-1 manufacturing model library can span capabilities from around the globe and all up and down the supply chain.

Question 5:

Insisting that all component models translate to a common semantic basis does not seem to play well with using existing tools. This applies to component and manufacturing models as one is predictive of properties promised in the other.

Answer 5:

True, there is a need to extract manufacturability constraints from manufacturing models and apply them to cull the META design trade space spanned by the component model library, but I am not convinced that (nor does the C2M2L-1 BAA require) the component models (TA1) and manufacturing models (TA3) be mapped to a common semantic domain. That might be too hard and not strictly necessary.

Question 6:

Is the performer of TA 4 also expected to provide hosting services (storage + other services) for TA1-TA3, and to vehicleforge.mil?

Answer 6:

Please refer to the BAA pg. 16 - "Host the C2M2L and facilitate model search, retrieval, and check-out."

Question 7:

What is the META language being used and who wrote it?

Answer 7:

We do not have a definitive META language spec yet. The META performers are still working on it (there are four doing language work: IBM Research, BAE Systems, Adventium Enterprises, and Vanderbilt University ISIS). The approach we are taking in the C2M2L-1 BAA is to request that component models be represented in domain-specific modeling languages that have formal semantics. The TA4 performers or another party will then worry about doing semantic integration and model conversion downstream.

Question 8:

Can you verify that this will include the fully operational system, including all nonfunctional requirements expected from such system (availability, reliability, scale, etc.)?

Answer 8:

"Nonfunctional" design requirements are critical design drivers and as such need to be included in this project. These will likely not be identical as those used for operational systems currently deployed or being developed.

Question 9:
On TA 4 it is written, “Maintain a model provenance framework that consistently and coherently maintains the history and quality evidence base for ascertaining model correctness and validity.” Can you please provide more details on this requirement, and especially what is expected from “correctness and validity” perspective? Is this part of the correct by construction vision inside the component library?
Answer 9:
Reading this requirement as levying correctness-by-construction is too stringent. The "provenance framework" is basically intended to maintain a pedigree for each piece of data in a model (e.g. Where did it come from? Who contributed it? How was it derived? What confidence do we have in it? What's the likely uncertainty in it?)

Question 10:
Would it be safe to say DARPA is looking for a systems synthesis solution to input various domain models? System synthesis is the integration of subsystems, regardless of what language or code was used to create them.
Answer 10:
If the question is about whether DARPA is looking for system synthesis tools in C2M2L-1, then the answer is "no"--we are looking for models on which other tools (being developed under parallel efforts) can operate.

Question 11:
Do META 1 and 2 along with iFAB provide the analysis portions relevant to the C2M2L-1 models or does C2M2L-1 require not only the model abstractions but the analysis of them as well?
Answer 11:
It is unclear what is meant by "analysis." C2M2L-1 is intended to provide model data on which META tools (for vehicle design/verification) and iFAB tools (for factory design/configuration) operate to yield real designs, so C2M2L-1 is purely about populating models, not about tools or algorithms that operate on the models except insofar as TA4 is concerned with model translation and transformation.

Question 12:
Must models generated under C2M2L be general enough to provide information relevant to any type of simulation undertaken using META or iFAB?
Answer 12:
The BAA roughly scopes the classes of information that must be in the models. It is vaguest on semantic content, but pretty explicit on model data. We think the data enumerated in the BAA should suffice to support any META or iFAB solver needs that may arise.

Question 13:

At what point in the timeline do you see reaching implementation of these technologies in the development of a FANG vehicle prototype and will DARPA release a new BAA for industry participants?

Answer 13:

The first vehicle design challenge, focused on the mobility/drivetrain portions of FANG, should come out in Sept/Oct 2012. We have an updated schedule chart that we will post to the C2M2L-1 BAA page on FedBizOpps and also to the AVM page on the DARPA website. The vehicle design challenge will be open to all and it will utilize META tools, iFAB tools, the C2M2L-1 libraries, and vehicleforge.mil; so it will be the first "product thread" that we pull through all of the pieces of AVM.

Question 14:

The BAA says “Provide semantic support for TA1, TA2, and TA3 performers. Ensure that every performer’s model can be mapped to a common semantic domain, including model as well as interaction semantics.” On your answer above you said “but I am not convinced that (nor does the C2M2L-1 BAA require) the component models (TA1) and manufacturing models (TA3) be mapped to a common semantic domain.” Can we assume that only models from TA1 and TA2 need to be mapped to common semantic domains?

Answer 14:

I think semantic integration is essential across the myriad of TA1 and TA2 models that we will get in different domain-specific languages. If it ends up being feasible to integrate TA3 manufacturing models, that would be swell. Intentional Software in iFAB is trying to do that. If a C2M2L-1 TA4 performer wants to try and do that also, I would be thrilled, but I think it's very hard and not strictly essential.

Question 15:

For "tools being developed under parallel efforts," DARPA needs a backbone that can import these into a common backbone to assess effect on the performance of subsystems and overall FANG vehicle system (i.e. Matlab/Simulink calculations and models become functional representations in the system model).

Answer 15:

The capability you describe is precisely what the META program is about: being able to take C2M2L-1 component and context models, synthesize system designs at various levels of abstraction, and verify those designs against various C2M2L-1 context models to estimate performance.

Question 16:

Does DARPA favor proposals from TA1, TA2 and TA3 that connect (on the proposal phase) to performers on TA4, so semantic alignment can be planned in advance (separate proposals for the different TAs that reference each other (from TA1-3 to TA4) and agree on the semantic approach)?

Answer 16:

If you mean whether we want one proposal that addresses multiple TAs, then the answer is that it is acceptable but certainly not required. If you mean whether we would favor a set of

multiple "pre-coordinated" proposals across various technical areas, then I would just caution that each, to be successful, must stand on its own in the event that the others are not selected, so long as each is independently the right choice--then sure, obviously it would not hurt.

Question 17:
To what extent will TA4 performers be able to levy requirements on model providers from TA1, TA2, TA3 in order to facilitate integration? If there are multiple model providers and multiple TA4 efforts, is it required that all models be integrated into all C2M2L frameworks, and that all frameworks be able to use all models?
Answer 17:
It is a reasonable question to which I do not have an answer that you will find satisfying. The answer is that we will work this out in the course of performance. C2M2L-1 will be managed through PI meetings and the extent to which TA4 performers can "levy requirements" on TA1, TA2, TA3 will depend on how persuasive they can be on the merits of these "requirements" in PI meetings. It will be an organic process, and hopefully this uncertainty breeds flexibility in the C2M2L-1 proposals. Similarly, there might be various reasons why there are multiple TA4 performers. They could be complementary efforts; they could be multiple approaches to hedge risk; or they could be redundant to hedge risk. I cannot say which of those will be the case until we see what proposals we get.

Question 18:
Does META have a set of performance estimates defined which DARPA is interested in, other than the complexity metrics? Model parameters for components are dependent on the performances that are to be assessed.
Answer 18:
I assume you are asking about system-level (vehicle) performance? There are no requirements as of yet. We are working toward a pretty generalized design methodology in META and C2M2L-1 should support designs to a variety of requirements. But the current intent is to make the FANG requirements parallel those of the Marine Amphibious Combat Vehicle (ACV), so it will be things like mobility, lethality, survivability, etc.

Question 19:
What do you think the turn-around time will be (in terms of notifying selectees/non-selectees after proposal submission)?
Answer 19:
Award notification will probably occur before the end of August, but perhaps sooner. I think we have done pretty well on the AVM efforts in terms of turning around reviews (not always as well in terms of contracting timelines but those are outside our control, mostly).

Question 20:
As per the BAA, has DARPA made any progress in determining the ITAR status of models to be delivered under this effort?
Answer 20:

Not really. We are fighting hard at senior leadership levels in the Department of Defense, both to get waivers for the AVM pilot, but also to affect export control policy over the long run. I do not have any concrete progress to report, but it is something that we are actively working to address.

Question 21:
Are you willing to accept copyrighted models and honor the copyright? There are many models of drivetrain and mobility, but models from the commercial realm that could be refactored are largely copyrighted or otherwise protected somehow.
Answer 21:
Yes, we are not asking for a waiver of any IP rights. We just need sufficient rights to be able to promulgate the C2M2L-1 models openly to support the AVM challenges. So basically the government needs a worldwide, non-exclusive, royalty-free license to use/distribute/etc. the C2M2L-1 models (that is the DFAR definition of "unlimited rights"), but we will allow the creator of the models to retain copyright in most cases.

Question 22:
Will encrypted models be acceptable? Encrypted models provide the functional performance data for use in a backbone systems engineering configuration while protecting IP and proprietary model data.
Answer 22:
If the exposed functionality of the model were to comport with what the BAA requires, then it should not be a problem, but the devil is in the details, so I am loath to provide a blanket "yes that sounds good" or "no that won't work" without first seeing the detailed technical concept outlined in the proposal.

Question 23:
TA 4, Model Library Curation & Semantic Support, has significant similarity to technology areas being developed in the existing META, iFAB, and VehicleForge programs. Would a proposal from one or more META, iFAB, and/or VehicleForge performers to provide support for, and desired extensions of, those results to C2M2L awardees in the other areas, be considered responsive to this technical area? Or is the intent to reach a broader audience of potential offerors of new META, iFAB, and/or VehicleForge technologies?
Answer 23:
C2M2L-1 TA4 is specifically crafted to address an identified requirement within the AVM portfolio. A company's status as an existing performer does not impact, positively or negatively, the evaluation of their proposal submission to the C2M2L-1 BAA. DARPA welcomes proposals from all offerors who can adequately propose a complete and innovative solution to the tasks defined in any C2M2L-1 TA.

Question 24:
The C2M2L-1 BAA states that the funding opportunity is focused on "... the drivetrain and mobility subsystems of the FANG vehicle ..." These systems would clearly include the powerplant, gearboxes and driveshafts, but could DARPA please specify whether the track /

wheel / suspension system, water propulsors and any other major components are included in the envelope of interest?

Answer 24:

The solicitation is intended to include all the relevant components and subsystems required to design the full mobility solution for an infantry fighting vehicle. This includes suspension, amphibious propulsion, and other elements appropriate to vehicle motion.